Log On and Learn: The development and pedagogy of a Virtual Synchronous Learning platform for real-time lecture casting in modern tertiary level teaching.

Theory/Intro/Research

High levels of attrition rates in computer science higher education (Beaubouef and Mason, 2005) and an ever increasing demand for IT professionals across Europe (Van Heur, 2016) and further afield (Oliver, 2015) is putting great pressure on Higher Education Institutes to deliver good quality IT graduates. Enrolment numbers in computer science programmes is also showing a downward trend (HESA, 2014). More alarmingly research suggests that current low pass rates in programming subjects might be having a decremental effect on computer science student enrolment and retention (Watson, 2014). This action research study will present a new platform to allow HE institutes to deliver a high quality learning experience in software development and programming courses. This study relies on the recent advances in open source streaming technology and its growth to create a virtual synchronous classroom platform.

Current research into the design, development and delivery of webinars, live e-learning or live synchronous streaming platforms in HE is still in it's infancy, mostly due to the technology constraints. Several terms have been coined in order to identify this recent pedagogy methodology. Synchronous Virtual Classrooms (Martin, 2012), Live Virtual Classroom (Vue, 2013), multi-assess learning (Irvine, 2013) or blended synchronous learning (Bower et al, 2015) are used collectively to describe real time communication between the tutor and learners. They simultaneously interact with each other using a supported streaming software and hardware solution to collaborate in presentations, seminars or lectures. Participation in the learning event is synchronous, and more importantly not bound by the traditional restraints as with real-time on-campus lectures, such as location and format. It is now possible that a student's presence and activity during a scheduled real-time learning event is not restricted to being within a physical space/geography, leaving the learner to decide on whether to attend on or off campus. To accommodate a session the current technology solutions use instant messaging, screencasting, video and audio broadcasting and polling features (Martin and Parker, 2014).

McCue (2007) has suggested with the recent advancement in streaming infrastructure technology along with the pedagogy pros of on-campus and off-campus, a new pedagogy can be harnessed. Other studies have also found that students reported a positive if not better learning experience (Mohorovicic, 2011; Amhag, 2013 ; Irvine, 2013) using live synchronous technology to deliver course learning events. Reasons why learners are finding this approach appealing include: accessibility (Cunningham, 2014), encouraged active learning (Bower et al 2015), higher levels of engagement and community from off-campus students (Vue, 2013), high quality of learning experience (Irvine, 2013), and on-demand process for review post-event (McCue, 2007).

Current streaming technology and infrastructure is still developing. Technical and logistical problems were reported by the majority of case studies using third party platforms (Cunningham, 2014, Bower et al 2015, McCue, 2007; Mohorovicic, 2011; Martin et al, 2012). The purpose of this study is to develop a software platform that can reduce the technical difficulties that arise from current platforms that are being used in HE institutes.

The literature we found addressed only small class teaching case studies, therefore scalability in streaming synchronous classrooms needs further work (Irvine, 2013). Our research will rely on a larger class size of 134 studying at undergraduate level.

Other issues are also present in the current research, but one drawback that this study will attempt to resolve is the issue of increased cognitive load that is placed onto the tutor who is managing the learning event (Popov, 2009; Bower et al, 2015). The research feature set and the streaming delivery will be redesigned and its results recorded.

Methodology

The study incorporated a full-time 24 week undergraduate PHP web development and programming module. As part of the delivery approach the majority of teaching weeks involved students participating in a virtual synchronous classroom. They could either choose to be on-campus or off-campus. The web-based streaming platform was designed and developed by the research team so that the scaling of the participant numbers did not compromise the quality if the streaming.

A reduction of the feature set when compared to other more populate systems on the market was implemented. The ability for learners to communicate via an audio or video stream was removed, with an instant text messaging system being the main mechanism for communication. Another major change was where the tutor's streaming content was located. Our approach moves the tutor and their streaming content to a private location that is not shared with the on-campus students. Having the teaching and streaming source in a small room meant all students, whether they be on/off campus, be treated as one cohort, online learners.

The feature set also excluded some of the traditional functionality found in other proprietary platforms that are deemed necessary in order to promote order and structure during collaborative activities between learners. These were: application sharing, hand-raising, whiteboard and breakout rooms. The design of a new feature set was developed in order to accommodate collaborative and community of practice. This involved giving learners the ability to generate support tickets which allows file sharing and instant text messaging via an external browser window. In turn moving the cognitive and management of learner questions and coding issues to the peer group rather than the tutor.

The students who used the virtual synchronous classroom platform were invited to participate in an anonymous survey via Google forms. The survey consisted of open and closed questions regarding their experience with the online delivery approach. Using a Statistical software the study can report inferential statistics. Learner analytic data, web server logs, archived instant messages and platform system log data, was collected so that a systematic review of events and learner behaviours can be investigated and correlated with the survey data.

The research questions that are answered are as follows:

- Is there a reduction in platform technical and logistical issues?

- Is the scaled platform capable of promoting the same positive learning attitudes as other research findings?

- If a reduced feature set equates to a reduced community of practice and collaboration?

Conclusions, Expected Outcomes or Findings

The survey shows that the logistics and technical issues published in other research has been greatly decreased. With a very low response identifying issues with the platforms audio, video or user interface.

Preliminary results from the survey are reporting a similar positive learning experience to that reported by Martin (2012) i.e. that the virtual synchronous classroom enhanced their learning experience. Therefore, it appears that the platforms design can cope with the pressure of scalability in participant numbers due to the platforms more focal feature set.

Filtering of learner analytic data is still in progress and reporting on community in practice is anecdotal. From observing the online behaviour of learners during these events with the amount of tickets generated there are encouraging signs of peer to peer support. The survey's initial findings are pointing to learners having an issue with support during these virtual synchronous classroom events.

While this research focuses on the teaching and learning of web programming in HE, the study should be of benefit to the wider educational disciplines and professional training sector.

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